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TRANSMITTAL LETTER
(General - Patent Pending)

Docket No.
Army 123

In Re Application Of: **Ibrahim**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
09/444,095	**Nov. 22, 1999**	**Sisson**	**30951**	**1634**	**8187**

Title: Purification Method and Apparatus

COMMISSIONER FOR PATENTS:

Transmitted herewith is:

Replacement Appeal Brief (in response to letter from Examiner dated Sept. 20, 2004)
(copy of Appeal Brief transmittal showing fee was paid for Appeal Brief)

in the above identified application.

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Caroline Nash
Signature

Dated: **October 4, 2004**

Caroline Nash, Reg. No. 36,329
Customer No.: 30951

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Caroline Nash (Date) 10/4/04
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Caroline Nash
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cc:

P16A/REV03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of
Ibrahim, Sofi
Serial No.: 09/444,095

Group Art Unit: 1634

Examiner: Sisson, B.

Filed: November 22, 1999

FOR: PURIFICATION METHOD AND APPARATUS

* * * * *

BRIEF ON APPEAL

Hon. Commissioner of Patents
and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action dated April 9, 2004 and letter dated September 20, 2004, Applicants submit herewith their Brief on Appeal in triplicate as required by 37 CFR § 1.92.

Real Party in Interest

The real party in interest is the U.S. Government as represented by the Secretary of the Army.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of the Claims

Claims 31-35, 38, 39, 63 and 65-70 are pending in the application.

Claims 1-30, 36-37, 40-62, 64 have been cancelled.

Claims 31-35, 38, 39, 63 and 65-70 stand finally rejected.

Status of the Amendments

Claims 31-35, 63 and 68-69 have been amended during the prosecution of this application. Claims 1-30, 36-37, 40-62, 64 have been cancelled. These amendments have been entered.

Amendments after final rejection include amendments to the specification and claims 63 and 65 presented in an Amendment After Final Rejection dated August 19, 2004 have not been entered.

Brief Summary of the Invention

The present invention is directed to a method of DNA or RNA purification. DNA or RNA containing sample is placed in a first reservoir tube with a solution to effect release of DNA or RNA from cells in the sample. A wand is inserted into the first reservoir tube. The wand comprises a cap, a sample collection assembly and an elongated shaft connecting the cap to the sample collection assembly. The sample collection assembly has microstructures for increasing the surface area of the sample collection assembly. Then the first reservoir tube is securely and sealingly closed with the cap of the wand with the shaft and the sample collection assembly inside the first reservoir tube. The first reservoir tube is then agitated to mix said sample with said solution under conditions for releasing the DNA or RNA from cells in the sample and non-specifically binding the DNA or RNA to the microstructures of the sample collection assembly. This causes non-specifical binding of the DNA or the RNA to the microstructures of the sample collection assembly. The wand is then removed from the first reservoir tube and inserted into a second reservoir tube that contains a wash buffer. The second reservoir tube is securely and sealingly closed with the cap of the wand with the shaft and the sample collection assembly inside the second reservoir tube. The second reservoir tube is agitated to mix the sample with the wash buffer under conditions to retain only the DNA or the RNA on the microstructures. (Page 2, lines 22-29) The wand is then removed from the second reservoir tube and inserted into a third reservoir tube. The third reservoir tube contains an elution buffer. The elution buffer causes release of the nucleic acids from the microstructures. The third reservoir tube is then incubated. The final step is to recover purified DNA or RNA from the third reservoir tube. (page 4, last paragraph, pag 5, lines 1-18).

In one embodiment the sample capture assembly has a main body having one or more flanges with microstructures for binding target molecules. (page 7, lines 16-18).

The microstructures are selected from cross-etched lanes, dimples, pillars and pores. (page 6, lines 15-19, page 7, lines 12-16).

The sample collection assembly can be a mesh outer surface wherein the microstructures are microparticles enclosed within the mesh outer surface. (Page 7, lines 23-28)

The microstructures of the sample collection assembly are coated with a material that binds non-specifically with nucleic acids. (page 7, last two lines, page 8, lines 1-4)

The material that binds non-specifically with nucleic acids is silicon oxide or aluminum oxide. (page 8, lines 1-2, original claim 12)

The invention also relates to a method of purifying specific DNA or RNA. This is accomplished by the steps of placing a purified DNA or RNA sample in a first reservoir tube under conditions to denature double stranded DNA or render RNA suitable for binding (p 10, lines 12-14); inserting a wand into the first reservoir tube (page 10, lines 14-15), wherein the wand has a cap, a sample collection assembly and an elongated shaft connecting the cap to the sample collection assembly. The sample collection assembly has microstructures for increasing the surface area of the sample collection assembly (page 6, lines 13-21); and the microstructures of the sample collection assembly are coated with a coating comprising sequence specific oligonucleotide probe, peptide nucleic acid probe through a linker arm, or biotin-streptavidin bond to capture specific target DNA or RNA (page 7, lines 25-30, page 8, lines 6-10, page 12, lines 13-16). The first reservoir tube is securely and sealingly closed with the cap of the wand with the shaft and the sample collection assembly inside the first reservoir tube (page 25, lines 10-12). The DNA or the RNA of the sample is incubated in the sample collection assembly under conditions whereby stable, specific hybridization structures are formed (page 10, lines 12-20). This binds the specific DNA or the specific RNA to the coating on the microstructures of the sample collection assembly. The wand is then removed from the first reservoir tube and inserted into a second reservoir tube that contains a wash buffer. The second reservoir tube is securely and sealingly closed with the cap of the wand with the shaft and the sample collection assembly inside the second reservoir tube. The second reservoir tube is agitated to mix the sample with the wash buffer under conditions to retain only the DNA or the RNA on the microstructures. The wand is then removed from the second reservoir tube and inserted into a third reservoir tube. The third reservoir tube contains an elution buffer to effect release of the DNA or the RNA. The reservoir tube is then incubated. The specific DNA or RNA is then recovered from the third reservoir tube. (page 4, last paragraph, pag 5, lines 1-18, page 10, lines 12- end of page to page 11, lines 1- 5)

In one embodiment, the conditions for denaturing DNA or rendering RNA suitable for binding are heating the reservoir tube for a sufficient time to denature the double stranded DNA or render the RNA suitable for binding. (page 10, lines 12-17)

The sample collection assembly of the invention has microstructures are deep reactive ion etchings or toolings that provide an increased surface area on the sample collection assembly. (page 6, lines 15-19)

The DNA coating is single stranded DNA and double stranded hybridization structures are formed. (page 4, lines3-4, 20-23, page 7, lines 26-28, page 8, lines 6-10).

The DNA coating can also be double stranded DNA and triplex hybridization structures are formed. (page 4, lines3-4, 20-23, page 7, lines 26-28, page 8, lines 6-10).

In another embodiment the invention is a method of purifying specific DNA or RNA that is accomplished by the steps of: placing a purified DNA or RNA sample in a first reservoir tube under conditions to denature double stranded DNA or render RNA suitable for binding; inserting a wand into the first reservoir tube, wherein the wand has a cap, a sample collection assembly and an elongated shaft connecting the cap to the sample collection assembly. The sample collection assembly has microstructures for increasing the surface area of the sample collection assembly and the microstructures of the sample collection assembly are coated with a coating. The coating is sequence specific oligonucleotide probe, peptide nucleic acid probe through a linker arm, or biotin-streptavidin bond to capture specific target DNA or RNA. The first reservoir tube is then securely and sealingly closing with the cap of the wand with the shaft and the sample collection assembly inside the first reservoir tube. Then the DNA or the RNA of the sample is incubated in the sample collection assembly under conditions whereby stable, specific hybridization structures are formed, thereby binding the specific DNA or the specific RNA to the coating on the microstructures of the sample collection assembly. The wand is then removed from the first reservoir tube and inserted into a second reservoir tube. The second reservoir tube contains a wash buffer. The second reservoir tube is then securely and sealingly closed with the cap of the wand with the shaft and the sample collection assembly inside the second reservoir tube. The second reservoir tube is then agitated to mix the sample with the wash buffer under conditions to retain only the DNA or the RNA on the microstructures. The wand is then removed from the second reservoir tube and inserted into a third reservoir tube. The said third reservoir tube is heated under conditions to effect release of the DNA or the RNA from the microstructures. The sample collection assembly is then

removed from the third reservoir tube and the specific DNA or RNA is removed from the third reservoir tube. (page 4, last paragraph, pag 5, lines 1-18, page 11, line 12; page 12, example 2.)

Issues

1. Whether documents in the specification are improperly incorporated by reference.

2. Whether claims 31-35, 38, 39, 63 and 65-70 comply with the description requirements under 35 USC 112, first paragraph.

3. Whether claims 31-35, 38, 39, 63 and 65-70 are patentable over Van Ness et al. (US Patent 5,514,785) in view of Boom et al., JP 7-308184A and Wiggins (US Patent No. 5,637,687).

Grouping of Claims

Claims 31-35, 38, 39, 63 and 65-70 stand or fall together.

Argument

a. Prosecution background:

It is respectfully brought to the Board's attention that there have been numerous office actions (several phone calls to Applicant's representative prior to the first Office Action in which the Examiner requested certain claim amendments, which when made were promptly rejected in the first office action, three more office actions and an advisory action) over four years and on February 25, 2003, the Examiner for the first time asserted that the claimed invention was not within the scope of the specification with respect to enablement of "alternative wash, elution buffers, sample sizes" as recited on pages 3-4 of the February 25, 2003 Office Action. Further, Applicant made every claim amendment suggested by the Examiner in the interview of June 25, 2002 to address section 112 rejections. The Examiner appeared satisfied in the office action of September 11, 2002 that there were no more section 112 issues. On February 25, 2003, the Examiner made a new section 112 rejection that could have been made in the first office action. Applicants contend that the Examiner has been extremely unfair to Applicant in that there appears to never have made a thorough examination in the first place.

Issue No. 1: Whether documents in the specification are improperly incorporated by reference.

The Examiner's assertion on pages 2-5 of the final office action dated April 9, 2004, that the subject matter incorporated by reference in the present specification, is improper and without merit.

The Applicant has incorporated non-essential subject matter in the present specification at page 8, line 11 through page 9, line 24. The material incorporated by reference has been included to show background of the invention or illustrate the state of the art. This material refers to numberous articles that show nucleic acid, protein, or cell capture on solid supports using methods and materials that are well known in the art. This is general background material indicating that nucleic acid capture is known in the art. Further, a statement was included in the specification that indicated that the documents that were incorporated by reference "are well known in the art as described in the following and other references, of which these are incorporated by reference:" See page 8, line lines 13-14.

In addition, Applicant identified specific portions of the referenced documents where the subject matter being incorporated may be found as is required by MPEP 608.01(p)(I)(A).

Applicant has claimed a method that uses a new sample collection assembly with reservoir tubes to improve on the old ways of nucleic acid capture on solid supports. Therefore, the subject matter relating to capture of nucleic acids on old types of supports using standard bufferes and other reagents simply shows the state of the art which would be recognized by one of ordinary skill in the art.

It is respectfully submitted that the subject matter incorporated by reference on pages 8 and 9 of the specification is proper.

Issue No. 2 Whether claims 31-35, 38, 39, 63 and 65-70 comply with the description requirements under 35 USC 112, first paragraph.

The Examiner's assertions, that the subject matter of the present claims is not described in the specification in such a way that one of ordinary skill in the art could practice the invention, is without merit.

The present invention is directed to a method for the capture of nucleic acids with a specific and novel apparatus. Applicant asserts that the method of capturing nucleic acids with the apparatus described is novel and extremely useful because the apparatus used in the method provides a vast surface area to maximize binding of molecules and also a series of reservoir tubes that eliminate the need for centrifugation. In addition, the method is inexpensive and lends itself to in-home use or field use because of the configuration of the device.

As stated above in Issue 1, the capture of nucleic acids on solid supports and the reagents and reaction conditions associated therewith are well known in the art. However, the present invention provides method steps that incorporate the use of a novel apparatus. Applicant asserts and one of ordinary skill in the art would recognize that the novelty of the method of the invention is the use of a novel device for sample processing using known protocols and techniques.

The Examiner maintains that the specification does not support the method of the invention for reasons, most of which relate to reaction conditions, types of reagents, types of nucleic acids, and source of the sample. Applicant maintains that all of these factors are well known in the art. The Examiner has not shown that such items are not well known in the art to rebut the Applicants assertions and evidence that they are well known in the art.

Evidence of background and state of the art presented.

- A Declaration Under 37 CFR 1.132 was filed on July 1, 2002 showing that the term "deep reactive ion etchings" is a term that is well known in the art.
- A copy of the incorporated by reference article of Boom, et al. "Rapid and Simple Method for Purification of Nucleic Acids" Journal of Clinical Microbiology, March 1990, pages 495-503 (see page 9, line 15 of specification) was provided to the Examiner to show that reaction conditions for the purification of nucleic acids on solid supports is well known in the art. The general principles of purification of nuclic acids are stated on page 495 under Materials and Methods, Outlines of the Procedure. Specific descriptions of lysis washing and elution bufferes are on page 496, paragraph 3 under (iii) buffers. This is evidence of background and state of the art.

Further, specific reagents, buffers, conditions and steps are provided for in the specification (page 2, lines 22-31 though page 3, lines 1-8, page 10, lines 12-31 through page 11, line 5) and examples (pages 11-12). There are many publications dealing with nucleic acid purification and some of these publications were cited as examples (pages 8 and 9) to illustrate the vast body of knowledge and information concerning the art of nucleic acid purification. Any individual with general knowledge in molecular biology has access to these publications, similar publications and most likely have been educated in these techniques in college or graduate school and would have no trouble incorporating appropriate conditions

and reagents into the method of the invention. It would be unnecessary to list every conceivable situation under which a user can utilize the method of the invention using the novel device.

The Examiner also asserts that RNA would be destroyed by the method of the invention. This assertion is without merit and is untrue.

The Applicant has performed many tests according to the claimed method and RNA is not destroyed. Further, one of ordinary skill in the art practicing the invention by the methods outlined in the specification and as claimed would not expect the RNA to be destroyed by ribonucleases as asserted by the Examiner. The procedures for purification of RNA and preserving its integrity are well known in the art. Voluminous articles in the literature teach the processes which deal with purification of nucleic acids from a variety of sample types. A list of the articles which deal with such processes were submitted in the disclosure. The use of a denaturant GITC was mentioned in the body of the invention disclosure, and the use of other denaturants was cited by reference to articles to show the state of the art. (See Current Protocols in Molecular Biology. Greene Publishing Associates and Wiley-Intersciences. John Wiley & Sons, New York, Chichester, Brisbane, Toronto, Singapore; Sambrook J., Fritsch EF, Maniatis J. (1989). Molecular cloning: A laboratory manual. 2nd edition, Cold Spring Harbor laboratory Press, Cold Spring Harbor, New York.). In the present invention, after applying the appropriate protocol to release RNA from a given sample, non-specific capturing of RNA onto the capture assembly, the captured RNA can be washed several times with RNAse-free washing buffer, then the RNA is eluted from the capture assembly by using an elution buffer. The Lysis/binding, washing and elution buffer conditions may be adapted according to the sample type and the type of the nucleic acids (DNA or RNA). Any individual skilled in the art can practice the invention to isolate high quality RNA by applying the basic guidelines for working with RNA. Such guidelines are well known and routinely practiced by researchers who deal with RNA work.

Regarding the bulleted items under on page 11 (10) of the office action, Applicant provides the following support:

- The source of the sample. The source of the sample is cells that contain DNA or RNA. (see page 10, lines 12-14)

- The composition of the lysis/denaturing buffer or wash buffer. Page 2, lines 22-31 and page 3, lines 1-8 provide examples of reagents known in the background of the art to be suitable.
- Descriptoin of cross-etched lanes, dimples, pillars and pores. These terms are found in any dictionary and are know to one of ordinary skill in the art. They are clear descriptions of three dimensional shape of a surface. Applicant asserts that they need no further description.
- The use of silicon oxide or aluminum oxide. The specification has been amended to incorporate these terms therein by amendment. This amendment is supported by original claim 39.
- Neutralization buffer. This term has been deleted from claim 63 by amendment.
- Heating of DNA or RNA in the third tube without the addition of an elution buffer. This is supported at page 10, last line through page 11, line 1. The DNA can be released by elution buffer or by heating.

Applicants respectfully submit that the claims are enabled by the specification and could be practiced by one of ordinary skill in the art based on the level of skill in the art as indicated by the references that have been incorporated by reference. It is respectfully submitted that the present claims are in compliance with section 112, first paragraph and this rejection is overcome.

Issue No. 3 Whether claims 31-35, 38, 39, 63 and 65-70 are patentable over Van Ness et al. (US Patent 5,514,785) in view of Boom et al., JP 7-308184A and Wiggins (US Patent No. 5,637,687).

Applicant's amendment filed on December 4, 2002 only corrected the dependency of claims 68 and 69. No other amendment to the claims was made that would have necessitated grounds for a new search. Applicant wonder why the above references were never cited in the previous Office Action dated September 11, 2002 or at any other times over the four years preceeding the February 25, 2003 Office Action. Again, Applicants assert that they were never given a thorough examination in the first place and have had to endure great expense as a result.

The present claims under examination are directed to a purification method for recovering purified

DNA or RNA from a sample using an assembly as claimed that requires a wand having a cap, a shaft and a sample collection assembly with microstructures. The claims also call for reservoir tubes that are securely and sealingly closed by the cap on the wand. The purpose for this unique design is at least two fold and solves two problems at once. First the microstructures are present to increase the surface area of the sample collection assembly to capture a greater amount of nucleic acids. Secondly, the use of the wand and reservoir tubes permits a military service member or other user to perform nucleic acid purification of a sample out in the field, for example during a military action where there is no electricity to vortex a sample. A user can simply agitate the reservoir tubes with the wand/sample collection assembly in place to cause the desired reaction to occur.

Bringing the answer to these two problems into a single apparatus and method has not been disclosed or suggested by any of the cited references.

Van Ness et al. is directed to compositions and methods for covalently immobilizing an oligonucleotide onto a polymer coated bead or similar structure. Van Ness et al. does not disclose or suggest the use of a wand and reservoir tube to collect nucleic acids where the reservoir tube is sealingly secured to the cap of the wand as required by the present claims. A user of the method of the present invention can use reservoir tube and wand assembly in the field by simply agitating the assembly by hand because of the claimed "seal" of the cap to the reservoir tube.

A dipstick is suggested by Van Ness that comprises a nonporous solid support having a means for attaching beads. The dipstick disclosed in Van Ness et al. is non-porous. The sample collection assembly in the present claims has microstructures.

Further, as stated by the Examiner, Van Ness et al. also does not disclose the binding of nucleic acids to a silica oxide support and elution and purification of the captured nucleic acids. Van Ness et al. is only concerned with immobilization of oligonucleotides and not purification. Van Ness et al. also does not disclose a need for microstructures or for sealingly closing the cap to the reservoir tube. Therefore, Van Ness et al. is different in scope and purpose and does not lead one of ordinary skill in the art to the present invention.

Boom, et al. is directed to a method for the purification of nucleic acids. Boom et al. discloses the use of silica particles to capture nucleic acids. However, the silica particles are free floating in solution and are not attached to a "sample collection assembly" on a wand. Further, Boom et al. does not suggest

any need to attach the silica particles to a "sample collection assembly" on a wand. Thus, Boom et al. does not render obvious the presently claimed invention that requires "*said wand comprises a cap, a sample collection assembly and an elongated shaft connecting said cap to said sample collection assembly, said sample collection assembly having microstructures for increasing the surface area of the sample collection assembly.*" Boom et al. does not solve the problems that the present invention is designed to solve as stated above. Therefore, Boom et al. does not add anything to Van Ness et al. to lead one of ordinary skill in the art to the present invention.

JP-7-308184 shows a tube and a wand. The Examiner asserts that a seal is formed between a cap and the tube. Applicants request the Examiner to point out where in this reference it is stated that a seal is formed. No translation of the abstract has been provided to Applicants. The Examiner asserts that the wand can be used for the collection of biological samples that are later used for PCR. However, there is no suggestion of performing the method of the present invention with such steps as agitating the reservoir tube to mix the sample under conditions for releasing DNA or RNA. Further, there is no suggestion of using multiple reservoir tubes or of using microstructures on the wand. Therefore, JP7-308184 does not suggest the claimed method of the invention or provide any motivation for modifying Van Ness et al. or Boom et al.

Wiggins is directed to compositions and methods for isolating nucleic acids from biological tissues and cells and for tissue/cell solubilization for other molecular biological. The method in Wiggins uses gravity or centrifugation and not agitation as claimed in the present invention. There is also no disclosure of the use of multiple reservoir tubes, a wand or a sealing engagement of a cap to a reservoir tube. Wiggins only discloses eluting captured nucleic acids from a solid support such as co-polymer beads. Therefore, Wiggins does not make up for the deficiencies of the other references which fail to disclose the use of multiple reservoir tubes, sealed caps, wands with microstructures and the purification of DNA and RNA with such a device.

In summary, none of the cited references, whether taken alone or in combination, would have lead one of ordinary skill in the art to the present invention because none of them provide a method for DNA or RNA purification that employs a wand having a sample collection assembly with microstructures. No single invention or combination of inventions cited by the Examiner contains all the features claimed in the present invention in terms of simplicity and adaptability. Further, none of the references provide the

required motivation in the form of a single statement or suggestion to make their combination as required by 35 U.S.C. §103(a) that would have lead one of ordinary skill in the art to the presently claimed invention. The mere assertion that that several references could have been combined without any supporting phrase by even one comment in any of the references that supports their combination is insufficient to uphold this rejection. Therefore, the rejection under 35 U.S.C. §103(a) is believed overcome.

Conclusion

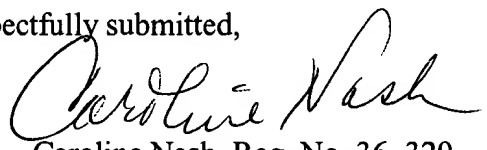
In conclusion, it is respectfully submitted that the presently claimed invention is fully enabled under 35 USC 112, first paragraph and is also patentable over Van Ness et al. (US Patent 5,514,785) in view of Boom et al., JP 7-308184A and Wiggins (US Patent No. 5,637,687).

Further, it is respectfully submitted that the subject matter that was incorporated by reference was done so properly according to MPEP 608.01(p)(I)(A).

Accordingly, reversal of the rejections and allowance of the application are respectfully requested.

Respectfully submitted,

Date: October 4, 2004

By 

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APPENDIX

31. (previously amended) A method of DNA or RNA purification comprising:

placing a DNA or RNA containing sample in a first reservoir tube with a solution to effect release of DNA or RNA from cells in said sample;

inserting a wand into said first reservoir tube, wherein said wand comprises a cap, a sample collection assembly and an elongated shaft connecting said cap to said sample collection assembly, said sample collection assembly having microstructures for increasing the surface area of the sample collection assembly;

securely and sealingly closing said first reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said first reservoir tube;

agitating said first reservoir tube to mix said sample with said solution under conditions for releasing said DNA or RNA from cells in said sample and non-specifically binding said DNA or RNA to said microstructures of said sample collection assembly, thereby non-specifically binding said DNA or said RNA to said microstructures of said sample collection assembly;

removing said wand from said first reservoir tube and inserting said wand into a second reservoir tube, said second reservoir tube containing a wash buffer;

securely and sealingly closing said second reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said second reservoir tube;

agitating said second reservoir tube to mix said sample with said wash buffer under conditions to retain only said DNA or said RNA on said microstructures;

removing said wand from said second reservoir tube and inserting said wand into a third reservoir tube, said third reservoir tube containing an elution buffer, wherein said elution buffer causes release of said nucleic acids from said microstructures;

incubating said third reservoir tube; and

recovering purified DNA or RNA from said third reservoir tube.

32. (previously amended) The method of claim 31, wherein said sample capture assembly comprises a main body having one or more flanges with microstructures for binding target molecules.

33. (previously amended) The method of claim 32, wherein said microstructures are selected from the group consisting of cross-etched lanes, dimples, pillars and pores.

34. (previously amended) The method of claim 31, wherein said microstructures are selected from the group consisting of cross-etched lanes, dimples, pillars and pores.

35 (previously amended) The method of claim 31, wherein said sample collection assembly comprises a mesh outer surface wherein said microstructures are microparticles enclosed within said mesh outer surface.

38. The method of claim 31, wherein said microstructures of said sample collection assembly are coated with a material that binds non-specifically with nucleic acids.

39. The method of claim 38, wherein said material is silicon oxide or aluminum oxide.

63. A method of purifying specific DNA or RNA comprising:

placing a purified DNA or RNA sample in a first reservoir tube under conditions to denature double stranded DNA or render RNA suitable for binding;

inserting a wand into said first reservoir tube, wherein said wand comprises a cap, a sample collection assembly and an elongated shaft connecting said cap to said sample collection assembly, said sample collection assembly having microstructures for increasing the surface area of the sample collection assembly, and said microstructures of said sample collection assembly are coated with a coating comprising sequence specific oligonucleotide probe, peptide nucleic acid probe through a linker arm, or biotin-streptavidin bond to capture specific target DNA or RNA;

securely and sealingly closing said first reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said first reservoir tube, and incubating said DNA or said RNA of the sample in the sample collection assembly under conditions whereby stable, specific hybridization structures are formed, thereby binding said specific DNA or said specific RNA to said coating on said microstructures of said sample collection assembly;

removing said wand from said first reservoir tube and inserting said wand into a second reservoir tube, said second reservoir tube containing a wash buffer;

securely and sealingly closing said second reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said second reservoir tube;

agitating said second reservoir tube to mix said sample with said wash buffer under conditions to retain only said DNA or said RNA on said microstructures;

removing said wand from said second reservoir tube and inserting said wand into a third reservoir tube, said third reservoir tube containing an alkaline elution buffer to effect release of said DNA or said RNA;

incubating said third reservoir tube;

removing said sample collection assembly from said third reservoir tube;

adding neutralization buffer to said third reservoir tube to stabilize said DNA or said RNA; and

recovering said specific DNA or RNA from said third reservoir tube.

65. The method of claim 63, wherein said conditions for denaturing DNA or rendering RNA suitable for binding comprise: heating said reservoir tube to 95°C for a sufficient time to denature said double stranded DNA or render said RNA suitable for binding.

66. The method of claim 63, wherein said microstructures comprise deep reactive ion etchings or toolings that provide an increased surface area on said sample collection assembly.

67. The method of claim 31, wherein said microstructures comprise deep reactive ion etchings or toolings that provide an increased surface area on said sample collection assembly.

68. The method of claim 63, wherein said DNA coating is single stranded DNA and double stranded hybridization structures are formed.

69. The method of claim 63, wherein said DNA coating is double stranded DNA and triplex hybridization structures are formed.

70. A method of purifying specific DNA or RNA comprising:

placing a purified DNA or RNA sample in a first reservoir tube under conditions to denature double stranded DNA or render RNA suitable for binding;

inserting a wand into said first reservoir tube, wherein said wand comprises a cap, a sample collection assembly and an elongated shaft connecting said cap to said sample collection assembly, said sample collection assembly having microstructures for increasing the surface area of the sample collection assembly, and said microstructures of said sample collection assembly are coated with a coating comprising sequence specific oligonucleotide probe, peptide nucleic acid probe through a linker arm, or biotin-streptavidin bond to capture specific target DNA or RNA;

securely and sealingly closing said first reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said first reservoir tube, and incubating said DNA or said RNA of the sample in the sample collection assembly under conditions whereby stable, specific hybridization structures are formed, thereby binding said specific DNA or said specific RNA to said coating on said microstructures of said sample collection assembly;

removing said wand from said first reservoir tube and inserting said wand into a second reservoir tube, said second reservoir tube containing a wash buffer;

securely and sealingly closing said second reservoir tube with said cap of said wand with said shaft and said sample collection assembly inside said second reservoir tube;

agitating said second reservoir tube to mix said sample with said wash buffer under conditions to retain only said DNA or said RNA on said microstructures;

removing said wand from said second reservoir tube and inserting said wand into a third reservoir tube;

heating said third reservoir tube under conditions to effect release of said DNA or said RNA from said microstructures;

removing said sample collection assembly from said third reservoir tube; and

recovering said specific DNA or RNA from said third reservoir tube.